

bars become larger than is generally supposed, and the resulting bending moments are by no means negligible. The theory of the straight stiffening-truss based upon the elastic deformation of the structure assumes that there is no sensible variation from the parabolic form of cable or frame. The thermal stresses in stiffened suspension bridges are discussed. This work should find a ready acceptance among engineers and students alike.

(2) It is not surprising that this work has reached a third edition in ten years for it possesses distinct merit and originality. Unlike the usual text-book on mechanics which is compiled by rigid adherence to academic method, it has a treatment all its own, and one that will commend itself alike to teachers and students who have left the abstract for the concrete problems met with in practical application. The author asserts that it is neither theoretical mechanics on one hand, nor applied on the other, since it does not include strength of materials, and the reader will not go far before discerning a judicious blend between the two extremes. The thirteen chapters comprise statics, friction, centre of gravity, rectilinear and curvilinear motion, translation and rotation, and work, energy, and power. The illustrations are clear and essentially represent objects familiar to the engineer.

(3) A short introductory chapter to this volume is devoted to the usual thermodynamic relations for air and other vapours, after which the various types of refrigerating machines and their construction are described. This is followed by the theory of refrigeration and the choice and properties of refrigerating mediums. We then find a chapter on testing refrigerating machines, followed by a discussion on insulation; and finally, the various commercial applications are dealt with. The discussion on refrigerants has been brought up to date by including the work of Mollier and others. The descriptions of refrigerating plant and methods are very complete.

(4) A perusal of this work will leave the reader in doubt as to the object of the writer, and yet he will conclude that it is an interesting and pleasantly written essay upon the motives and habits of the workman in the pursuit of his work. As human nature is the same the world over, it will doubtless be found to meet the characteristics of the English as well as the American workman, and perhaps to suggest to the employer some of the causes which have operated to give a nation a certain place in the industrial world. To American managers who have given the problems of works management a position among the sciences it would make a direct appeal, and

though most men of experience would find their views in general accord with those of the author, it is pleasant to find them confirmed by one who has evidently a clear and shrewd apprehension of the actuating forces that underlie all human endeavour. We would however be inclined to say *ça va sans dire* to much that the author has written. For instance, few will find fault with the statement that inertia is not confined to an inanimate mass and that it has to be overcome in a progressive business. Notwithstanding the somewhat trite remarks that we find throughout the work, there is a distinct charm about the manner of presentation, and as the author confesses to a feeling of incompleteness in the treatment, we must take what he has given us with this reservation and accept his contribution to a very large subject capable of indefinite variation.

(5) This work on the strength and physical properties of bricks, stone, mortar, cement, and masonry is a compilation of results of experiments with a discussion of the theory of elasticity as applied to such materials. The first chapter deals with the elastic properties in reference to Hooke's law and Poisson's ratio for the materials, and in the second the behaviour of materials under compression is dealt with, which is followed by a chapter on the flexure of beams. The ordinary tensile tests on various kinds of cement are described and the results tabulated. The strength of bricks based upon various experiments made by different men is, in view of the variable character of the material, of special interest, also the crushing strength of building stones of different kinds is given. The chapter on the crushing strength of brick piers is of special value as so little has been done in this direction, chiefly owing to the inherent difficulties of testing and rendering the results comparative. The effect of the quality of the bricks and mortar and the workmanship is discussed, the results obtained by Popplewell, Howard, and others being cited. The thickness of the joints, leading dimensions, and other possible variations in the test piers make it impossible to lay down any absolute laws as the result of the tests. The work ought to be of use to engineers as a guide to what has been done in a very large subject.

OUR BOOKSHELF.

Minerals and the Microscope: an Introduction to the Study of Petrology. By H. G. Smith. Pp. xi + 116 + xii plates. (London: Thomas Murby and Co., n.d.) Price 3s. 6d. net.

THE author of this convenient and systematic little treatise is Demonstrator of geology in the Imperial College of Science, London, where he has gained

experience through the introduction of large classes to the use of the microscope in petrology. The style is clear, and sufficient optical theory is introduced to add interest to determinative methods. The philosophic processes by which minerals are determined, affording as they do an insight into crystalline structure, are of far more value in class-work than actual specific identifications. The beautiful series of photographs of minerals as they appear in thin rock-slices is a very welcome feature, and gives special distinction to the book.

As an "introduction to petrology" the microscopic method often fails; this is seen, for instance, where the author (p. 103) regrets the difficulty of distinguishing the triclinic feldspars present in a granite. Surely, in a coarse-grained rock, a fragment broken from the mineral will supply material for other than optical tests. We do not know, again, how "microscopic investigation should always enable the student to make the distinction" (p. 112) between foliation and bedding, seeing that the two so frequently coincide in schists. But Mr. Smith has given us the handiest and best illustrated introduction that we possess to an important aspect of rock-minerals, and has even included a coloured plate of Newton's scale. If the student remembers that every rock-section has its parent rock, he may well place himself at an early stage of his work under the guidance of these lucid pages.

G. A. J. C.

Researches into Induced Cell-reproduction in Amoebae. By J. W. Cropper and A. H. Drew. Pp. 112 + plates. (The John Howard McFadden Researches, Vol. IV.) (London: John Murray, 1914.) Price 5s. net.

THE investigations described in this volume were undertaken with the view of supporting the theory of H. C. Ross, that cell-reproduction is brought about by certain chemical agents termed "auxetics," and that their effect is increased by the addition of other substances known as "kinetics." The authors claim to have confirmed this theory, and to have shown that the mode of action of these substances is probably through the medium of enzymes. The presence of these agents in the environment is stated to produce variations in the morphology of the organism. Methods of cultivation of amoebæ and their examination by the "jelly method," are described. The encystment of an amoeba is stated to be due to the action of certain deleterious bacterial products, and it is claimed that the subsequent excystation is caused by other products which act on the cyst-wall from without, and are of the nature of ferments. A detailed account is given of the preparation of cultures of the amoeba with pure strains of different bacteria. The amoeba used in these researches was a species found by the authors living in a solution of sodium chloride (1 per cent.) and sodium citrate (3 per cent.) in the laboratory, and named by them *Amoeba ostrea*. A parasitic micrococcus, which was very deadly to the amoeba, was also isolated and investigated.

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Song and Wings: a Posy of Bird Poems for Young and Old. By Isa J. Postgate. With a Preface by the Rev. Canon H. D. Rawnsley. Pp. xi + 50. (London: Alexander Moring, Ltd., 1914.) Price 2s. 6d. net.

MISS POSTGATE's pretty verse will serve a very useful purpose if, by arousing an interest in birds and bird-life, it assists in the arrest of the extermination of beautifully plumaged birds for the gratification of the desire for barbaric adornment fostered by modern fashion.

LETTERS TO THE EDITOR.

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Asymmetric Images with X-Radiation.

CONFIRMING our letter of July 16 on asymmetric haloes, we have found that the bands can be produced on one, two adjacent, three, or all sides of a square (lead), and when an obstacle is placed at or over one side the corresponding band only vanishes. These effects are independent of the incidence of the radiation. With V-shaped aperture, the apex resting on the plate, the bands on one side are sharply defined, and twice bent; on the other there are several, and they are diffuse and fainter.

The double bend is due to the fact that within a short range two edges contribute as in light.

With strips (steel), say, 4 cm. width, the white bands cross at various angles depending on the slope to the plate, but are afterwards dispersed at short distances from the edges they approach.

The diametric asymmetry excludes polarisation, and since it increases directly with the distance from the axis through the "optimum" (i.e. 15° from the direction at which light would be reflected) the rays must have some determination from the plane of the anti-kathode. In other words, they must be "polarised" in planes at successive angles to the direction of propagation. The continuance of the bands within the shadow beyond the range of light diffraction and their varying asymmetry show that X-radiation is something more than light of very short wave-length, or otherwise light itself must possess unequal polarity in its structure.

I. G. RANKIN.

W. F. D. CHAMBERS.

90 Gordon Road, Ealing.

Unit of Acceleration.

IT is a little surprising to find in Dr. Shaw's paper (December 16, 1913), "... He (Mr. Whipple) points out that we have no special name for the unit of acceleration." In NATURE of June 25, 1914, Mr. Whipple proposed the name "leo." So long ago as 1909 Wiechert used the term "gal" in the report for the Göttingen earthquake station for that unit, being the first syllable of Galileo, whence Mr. Whipple derives his "leo." Others, as well as myself, have used "gal," or rather "milligal," in analyses of earthquakes. A milligal is approximately a millionth of g. Dyne is the unit of force, gal the unit of acceleration.

OTTO KLOTZ.

Dominion Observatory, Ottawa, July 18.